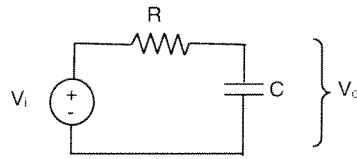
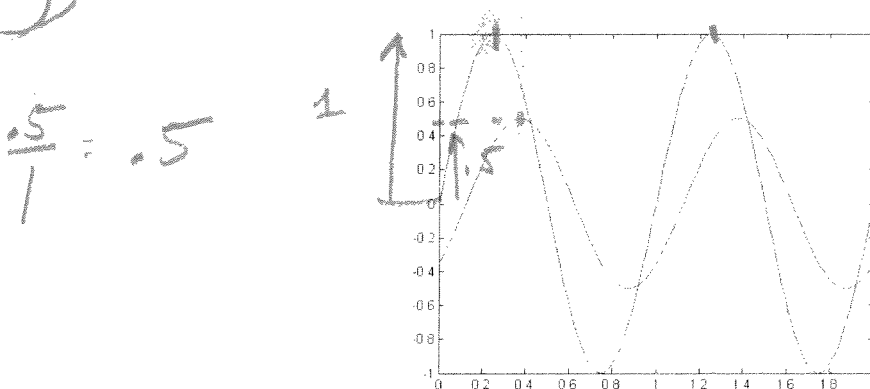


MAE 106 Post-Laboratory Quiz 2009
 Laboratory Exercise #2: Electrical Filters and First Order Systems



Consider the following circuit:

- What type of filter is this circuit?
 A. high pass filter B. band pass filter **C. low pass filter** D. notch filter
- Shown below are the input voltage and output voltage for a filter like the one above. What is the scaling factor (i.e. gain) of the filter for a sinusoid at this frequency?
A. 0.5 B. 1 C. 2 D. 0.4 E. 0.2



- What is the phase lag of the output sinusoid?
 A. π **B. $\pi/4$** C. 2π D. $\pi/2$ E. 3π
- What type of noise would you use this circuit to filter?
 A. low frequency noise **B. high frequency noise**
- If you put a step voltage of amplitude A in at V_i , and wait for $3 \cdot R \cdot C$ seconds, how big would V_o be (assuming it starts at zero)?
 A. $0.63A$ B. Ae^{-1} C. $0.63A$ **D. $A(1-e^{-3})$** E. $A(1-e^{-1})$
- If $C = 1 \mu\text{F}$ and $R = 10\text{K}\Omega$, what is the time constant of the system?
 A. 1 msec B. 1 sec C. 100 msec D. 0.1 msec **E. 10 msec**
- Given the values of R and C above, what is the cut-off frequency ω of the filter?
 A. 10 rad/s **B. 100 rad/s** C. 1 rad/s D. 0.5 rad/s E. 0.1 rad/s
- For an input frequency of $\omega = 1/RC$, what would the scaling factor (i.e. filter gain) be?
 A. $\text{sqrt}(2)$ **B. $1/\text{sqrt}(2)$** C. RC D. 0 E. 1
- Assume you switch the position of the resistor and capacitor, what type of filter would you have?
A. high pass filter B. band pass filter C. low pass filter D. notch filter

period = 1 sec
 phase lag ≈ -1 sec
 $\frac{\pi}{4} = \text{closest} = \frac{2\pi}{8} \leftarrow 1 \text{ period}$
 $V_o = A(1 - e^{-t/RC})$ $T = RC$
 if $t = 3RC$
 $V_o = A(1 - e^{-3RC/RC})$
 $= A(1 - e^{-3})$
 cutoff when
 $\omega = \frac{1}{RC} = 100 \text{ rad/sec}$
 Note at $\omega_c = \frac{1}{RC}$
 $|H(j\omega)| = \frac{1}{\sqrt{2}}$
 $= 0.707$